Learning Outcomes

- Be aware of the main acoustic cues that allow us to distinguish different *plosive* and *affricate* sounds

Acoustic cues - consonants

- Fricatives e.g. /s/, /ʃ/, /ʃ/ and the voiced equivalents /z/, /ɹ/, /ʒ/
- Plosives e.g. /p/, /t/, /k/ and /b/, /d/, /g/
- Affricates (combination of fricative and plosive) e.g. /tʃ/ as in “church” or /dʒ/ as in “jar”
- Nasals e.g. /m/, /n/ and /ŋ/ as in “ring”
- Approximants e.g. /w/, /ɹ/, /y/ and /l/
- For each different “manner” will look at the different place and voicing contrasts

Acoustics of consonant contrasts – plosives

- Plosives (stops) have a temporary interruption in the airflow due to closure at some place in the vocal tract
- Can see interruption more clearly when plosive is between syllables
- Plosive release associated with formant transitions as vocal tract changes shape (e.g. F1 rise)
- Shape of F2 transition is highly indicative of the place of articulation of the preceding plosive
- Affricates are like plosives with a more slowly opening release so that some frication occurs

Acoustics of consonant contrasts - plosives

- Another example of the relationship between vowel formants and the associated consonant is where the vocal tract needs to change shape depending on which vowel follows a particular consonant.
  - e.g. Where /iː/ or /u/ follows /d/
  - The vocal tract is in a certain shape for /d/ and then needs to change shape to go into the following vowel
  - Such formant transitions are important cues in a lot of consonant place contrasts
cues for voicing in plosives

• Onset of voicing accompanied by low-frequency energy associated with larynx activity (voice-bar)
• Syllable initial consonant:
  – Periodic structure to waveform
  – Voice onset time (VOT): time between plosive release and voicing onset
  – /bdg/ : VOT < about 25ms (may even be negative)
  – /ptk/ : VOT > about 25ms

• Syllable final plosives
  – Similar acoustic cues to syllable initial
  – Duration of silence between vowel offset (closure) and plosive release
  – Formant transitions at the end of the vowel
Acoustics of consonant contrasts - affricates

/frɑː:/ /dʒɑː:/

- frication
- release
- plosive release
- pre-voicing
- voice bar